

# AN80MxxRSP Series

5-pin, low dropout voltage regulator with standby function (500 mA type)

## Overview

The AN80MxxRSP series is a 0.5 A, low dropout voltage regulator IC with standby function, featuring low current consumption and low noise.

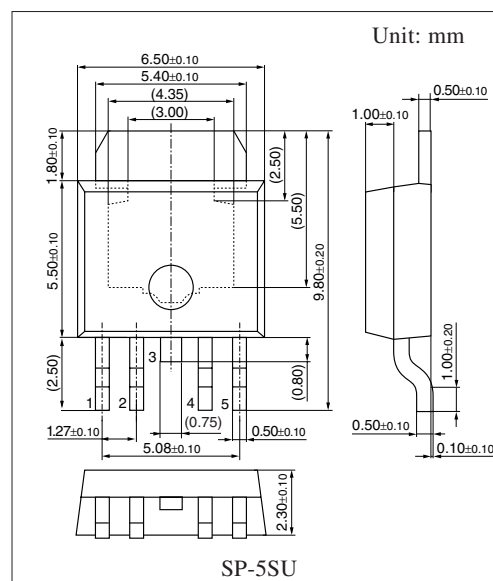
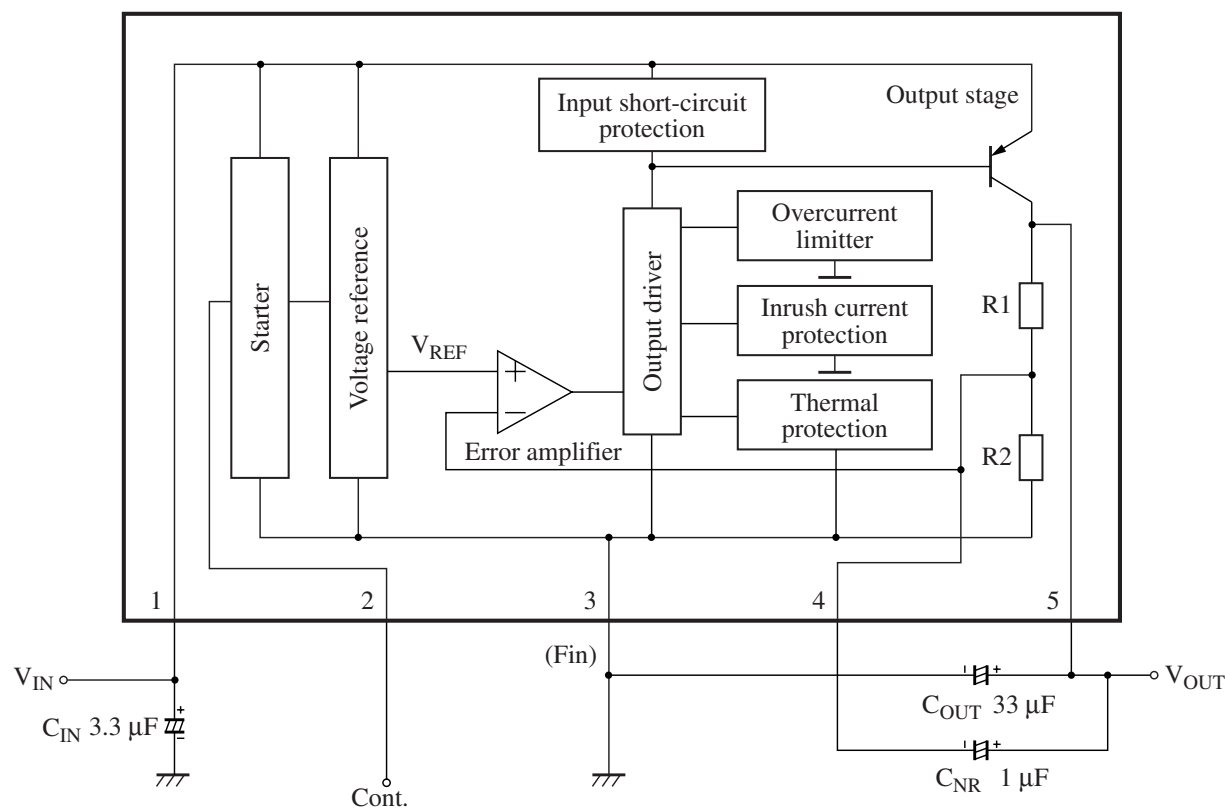
## Features

- Standby consumption current: max. 3  $\mu$ A
- Dropout voltage: 0.25 V
- Output voltage accuracy:  $\pm 3\%$
- 5-pin surface mounting package
- Ripple rejection ratio: 30 dB ( $f = 500$  kHz)
- Output voltage: 1.8 V, 1.9 V, 2.0 V, 2.1 V, 2.2 V, 2.5 V, 2.7 V, 2.8 V, 2.9 V, 3.0 V, 3.1 V, 3.2 V, 3.3 V, 3.4 V, 3.5 V, 3.6 V, 4.8 V, 4.9 V, 5.0 V, 5.1 V, 5.2 V, 5.3 V

## Applications

- General use power supply

## Block Diagram



## ■ Pin Descriptions

| Pin No. | Description   |
|---------|---|
| 1       | Input voltage pin ( $V_{IN}$ )  |
| 2       | Control pin (Cont.) High: operation, Low: stop                                |
| 3       | Grounding pin (GND) Electrically in common with radiation fin                 |
| 4       | Noise reduction pin (N.R.) Open when the noise reduction function is not used |
| 5       | Output voltage pin ( $V_{OUT}$ )  |

## ■ Absolute Maximum Ratings

| Parameter                                   | Symbol    | Rating      | Unit |
|---|-----------|-------------|------|
| Supply voltage                              | $V_{CC}$  | 14.4        | V    |
| Supply current                              | $I_{CC}$  | —           | mA   |
| Power dissipation <sup>*1</sup>             | $P_D$     | 255         | mW   |
| Operating ambient temperature <sup>*2</sup> | $T_{opr}$ | −30 to +85  | °C   |
| Storage temperature <sup>*2</sup>           | $T_{stg}$ | −55 to +150 | °C   |

Note) 1. The output voltage may exceed the rated value if  $T_j > 150^\circ\text{C}$  in no-load condition. Set to  $I_O > 5\text{ mA}$  if  $T_j$  is likely to exceed  $150^\circ\text{C}$ .

2. This IC is not suitable for automobile equipment use.

3. \*1: The above power dissipation shows the value of an independent IC without heat sink at  $T_a = 85^\circ\text{C}$ . For details, refer to "2. Power dissipation of SP-5SU package" in the Application Notes.

\*2: Except for the operating ambient temperature and storage temperature, all ratings are for  $T_a = 25^\circ\text{C}$ .

## ■ Recommended Operating Conditions

| Part No.   | Output voltage | Operating supply voltage range (V <sub>CC</sub> ) | Unit |
|------------|----------------|---|------|
| AN80M18RSP | 1.8            | 2.3 to 14.0                                       | V    |
| AN80M19RSP | 1.9            | 2.4 to 14.0                                       | V    |
| AN80M20RSP | 2.0            | 2.5 to 14.0                                       | V    |
| AN80M21RSP | 2.1            | 2.6 to 14.0                                       | V    |
| AN80M22RSP | 2.2            | 2.7 to 14.0                                       | V    |
| AN80M25RSP | 2.5            | 3.0 to 14.0                                       | V    |
| AN80M27RSP | 2.7            | 3.2 to 14.0                                       | V    |
| AN80M28RSP | 2.8            | 3.3 to 14.0                                       | V    |
| AN80M29RSP | 2.9            | 3.4 to 14.0                                       | V    |
| AN80M30RSP | 3.0            | 3.5 to 14.0                                       | V    |
| AN80M31RSP | 3.1            | 3.6 to 14.0                                       | V    |
| AN80M32RSP | 3.2            | 3.7 to 14.0                                       | V    |
| AN80M33RSP | 3.3            | 3.8 to 14.0                                       | V    |
| AN80M34RSP | 3.4            | 3.9 to 14.0                                       | V    |
| AN80M35RSP | 3.5            | 4.0 to 14.0                                       | V    |
| AN80M36RSP | 3.6            | 4.1 to 14.0                                       | V    |
| AN80M48RSP | 4.8            | 5.3 to 14.0                                       | V    |
| AN80M49RSP | 4.9            | 5.4 to 14.0                                       | V    |
| AN80M50RSP | 5.0            | 5.5 to 14.0                                       | V    |
| AN80M51RSP | 5.1            | 5.6 to 14.0                                       | V    |
| AN80M52RSP | 5.2            | 5.7 to 14.0                                       | V    |
| AN80M53RSP | 5.3            | 5.8 to 14.0                                       | V    |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$

## • AN80M18RSP (1.8 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 1.746 | 1.8  | 1.854 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 2.8\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 18    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 36    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 2.8\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 2.8\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | −5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 1.71\ \text{V}$ , $I_{OUT} = 0\ \text{A}$   | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 3.8\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 58.8  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 1.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.0\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 2.8\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 2.8\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 3.8\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 2.8\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M19RSP (1.9 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 1.843 | 1.9  | 1.957 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 2.9\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 19    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 38    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 2.9\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 2.9\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 1.805\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 3.9\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 58.4  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.1\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 2.9\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 2.9\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 3.9\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 2.9\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M20RSP (2.0 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 1.940 | 2.0  | 2.060 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.0\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 20    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 40    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.0\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.0\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 1.90\ \text{V}$ , $I_{OUT} = 0\ \text{A}$   | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.0\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 57.9  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.2\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.0\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.0\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.0\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.0\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M21RSP (2.1 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.037 | 2.1  | 2.163 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.1\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 21    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 42    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.1\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.1\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 1.995\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.1\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 57.5  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.3\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.1\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.1\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.1\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.1\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M22RSP (2.2 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.134 | 2.2  | 2.266 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.2\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 22    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 44    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.2\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.2\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.090\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.2\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 57.1  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.4\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.2\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.2\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.2\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.2\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |



# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M25RSP (2.5 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.425 | 2.5  | 2.575 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.5\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 25    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 50    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.5\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.5\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.375\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.5\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 56.0  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.6\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.7\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.5\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.5\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.5\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.5\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M27RSP (2.7 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.619 | 2.7  | 2.781 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.7\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 27    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 54    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.7\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.7\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.565\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.7\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 55.3  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.7\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.7\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.7\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.7\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M28RSP (2.8 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.716 | 2.8  | 2.884 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.8\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 28    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 56    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.8\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.8\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.660\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.8\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 55.0  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 2.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.8\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.8\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.8\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.8\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M29RSP (2.9 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.813 | 2.9  | 2.987 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 3.9\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 29    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 58    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 3.9\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 3.9\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.755\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 4.9\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 54.7  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 3.9\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 3.9\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 4.9\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 3.9\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 3.9\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M30RSP (3.0 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 2.910 | 3.0  | 3.090 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.0\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 30    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 60    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.0\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.0\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.85\ \text{V}$ , $I_{OUT} = 0\ \text{A}$   | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                       | 54.4  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.0\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.0\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M31RSP (3.1 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 3.007 | 3.1  | 3.139 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.1\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 31    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 62    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.1\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.1\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 2.945\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                       | 54.1  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.3\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.1\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.1\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5.1\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4.1\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4.1\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M32RSP (3.2 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 3.104 | 3.2  | 3.296 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.2\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 32    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 64    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.2\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.2\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 3.040\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5.2\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 53.8  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.4\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.2\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.2\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5.2\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4.2\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4.2\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M33RSP (3.3 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 3.201 | 3.3  | 3.399 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.3\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 33    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 66    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.3\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.3\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 3.135\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5.3\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 53.6  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.4\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.3\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.3\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5.3\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4.3\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4.3\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |



# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M34RSP (3.4 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 3.298 | 3.4  | 3.502 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.4\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 34    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 68    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.4\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.4\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 3.230\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5.4\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 53.3  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.5\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.6\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.4\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.4\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5.4\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4.4\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4.4\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M35RSP (3.5 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 3.395 | 3.5  | 3.605 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.5\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 35    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 70    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.5\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.5\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | −5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 3.325\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5.5\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 53.1  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.6\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.5\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.5\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5.5\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4.5\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4.5\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M36RSP (3.6 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 3.492 | 3.6  | 3.708 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 4.6\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 36    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 72    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 4.6\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 4.6\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 3.420\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 5.6\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 52.8  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 3.7\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 3.8\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 4.6\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 4.6\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 5.6\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 4.6\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 4.6\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M48RSP (4.8 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 4.656 | 4.8  | 4.944 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 5.8\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 48    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 96    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 5.8\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 5.8\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | −5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 4.560\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 6.8\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 50.3  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 4.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 5.0\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 5.8\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 5.8\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 6.8\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 5.8\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 5.8\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M49RSP (4.9 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 4.753 | 4.9  | 5.047 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 5.9\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 49    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 98    | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 5.9\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 5.9\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 4.655\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 6.9\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 50.1  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 5.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 5.1\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 5.9\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 5.9\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 6.9\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 5.9\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 5.9\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M50RSP (5.0 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 4.850 | 5.0  | 5.150 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 6.0\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 50    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 100   | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 6.0\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 6.0\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 4.75\ \text{V}$ , $I_{OUT} = 0\ \text{A}$   | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 7.0\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 49.9  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 5.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 5.2\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 6.0\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 6.0\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 7.0\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 6.0\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 6.0\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M51RSP (5.1 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 4.947 | 5.1  | 5.253 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 6.1\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 51    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 102   | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 6.1\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 6.1\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 4.845\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 7.1\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 49.8  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 5.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 5.3\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 6.1\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 6.1\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 7.1\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 6.1\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 6.1\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M52RSP (5.2 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 5.044 | 5.2  | 5.356 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 6.2\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 52    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 104   | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 6.2\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 6.2\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 4.940\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 7.2\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 49.6  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 5.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 5.4\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 6.2\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 6.2\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                  |
|---|-------------------------|--|-----|----------|-----|-----------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 7.2\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                    |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 6.2\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V[rms]}$    |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$ |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                    |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 6.2\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$      |



# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

## • AN80M53RSP (5.3 V type)

Unless otherwise specially provided, shorten each test time (within 10 ms) so that the test is conducted under the condition that the drift due to the temperature increase in the chip junction part can be neglected.  $C_{IN} = 3.3\ \mu\text{F}$ ,  $C_{NR} = \text{Open}$ ,  $C_{OUT} = 33\ \mu\text{F}$

| Parameter                                 | Symbol                 | Conditions  | Min   | Typ  | Max   | Unit          |
|---|------------------------|---|-------|------|-------|---------------|
| Output voltage                            | $V_{OUT}$              | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | 5.141 | 5.3  | 5.459 | V             |
| Line regulation                           | $REG_{IN}$             | $V_{IN} = 6.3\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | —     | —    | 53    | mV            |
| Load regulation                           | $REG_{LOA}$            | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 106   | mV            |
| Peak output current                       | $I_{PEAK}$             | $V_{IN} = 6.3\ \text{V}$ , The output current value when $V_{OUT}$ decreases by 5% from its value at $I_{OUT} = 250\ \text{mA}$ . | 600   | 900  | —     | mA            |
| Bias current under no load                | $I_{BIAS}$             | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 0\ \text{mA}$   | —     | 1.1  | 3.0   | mA            |
| Bias current fluctuation to input         | $\Delta I_{BIAS(IN)}$  | $V_{IN} = 6.3\ \text{V} \rightarrow 14.0\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$  | -5    | —    | 5     | mA            |
| Bias current fluctuation to load          | $\Delta I_{BIAS(LOA)}$ | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 0\ \text{mA} \rightarrow 500\ \text{mA}$  | —     | —    | 25    | mA            |
| Standby consumption current               | $I_{STB}$              | $V_{IN} = 14.0\ \text{V}$ , $V_{CONT} = 0\ \text{V}$  | —     | —    | 3.0   | $\mu\text{A}$ |
| Bias current before starting regulation   | $I_{RUSH}$             | $V_{IN} = 5.035\ \text{V}$ , $I_{OUT} = 0\ \text{A}$  | —     | —    | 5     | mA            |
| Control terminal current                  | $I_{CONT}$             | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$<br>$V_{CONT} = 1.8\ \text{V}$   | —     | —    | 30    | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | RR1                    | $V_{IN} = 7.3\ \text{V} \pm 1\ \text{V}$ , $f = 120\ \text{Hz}$<br>$I_{OUT} = 100\ \text{mA}$                                     | 49.5  | —    | —     | dB            |
| Minimum input/output voltage difference 1 | $V_{DIF(min)1}$        | $V_{IN} = 5.4\ \text{V}$ , $I_{OUT} = 250\ \text{mA}$   | —     | 0.25 | 0.45  | V             |
| Minimum input/output voltage difference 2 | $V_{DIF(min)2}$        | $V_{IN} = 5.5\ \text{V}$ , $I_{OUT} = 500\ \text{mA}$   | —     | —    | 0.8   | V             |
| Control terminal threshold high voltage   | $V_{CONTH}$            | $V_{IN} = 6.3\ \text{V}$  | —     | 1.45 | 1.80  | V             |
| Control terminal threshold low voltage    | $V_{CONTL}$            | $V_{IN} = 6.3\ \text{V}$  | 0.50  | 0.70 | —     | V             |

## • Design reference data

Note) The following values are typical and not guaranteed values.

| Parameter                                 | Symbol                  | Conditions   | Min | Typ      | Max | Unit                      |
|---|-------------------------|--|-----|----------|-----|---------------------------|
| Ripple rejection ratio 2                  | RR2                     | $V_{IN} = 7.3\ \text{V} \pm 1\ \text{V}$ , $f = 500\ \text{kHz}$<br>$I_{OUT} = 100\ \text{mA}$                                   | —   | 30       | —   | dB                        |
| Output noise voltage                      | $V_{NO}$                | $10\ \text{Hz} \leq f \leq 100\ \text{kHz}$ , $I_{OUT} = 100\ \text{mA}$<br>$V_{IN} = 6.3\ \text{V}$ , $C_{NR} = 1\ \mu\text{F}$ | —   | 40       | —   | $\mu\text{V}[\text{rms}]$ |
| Output voltage temperature coefficient    | $\frac{dV_{OUT}}{dT_a}$ | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$<br>$-30^\circ\text{C} \leq T_a \leq +125^\circ\text{C}$                      | —   | $\pm 40$ | —   | ppm/ $^\circ\text{C}$     |
| Output short-circuit current              | $I_{OSHORT}$            | $V_{IN} = 14.0\ \text{V}$ , $V_{OUT} = \text{GND}$   | —   | 300      | —   | mA                        |
| Overheat protection operating temperature | $T_{JTH}$               | $V_{IN} = 6.3\ \text{V}$ , $I_{OUT} = 5\ \text{mA}$  | —   | 150      | —   | $^\circ\text{C}$          |

## ■ Application Notes

### 1. External compensation capacitor

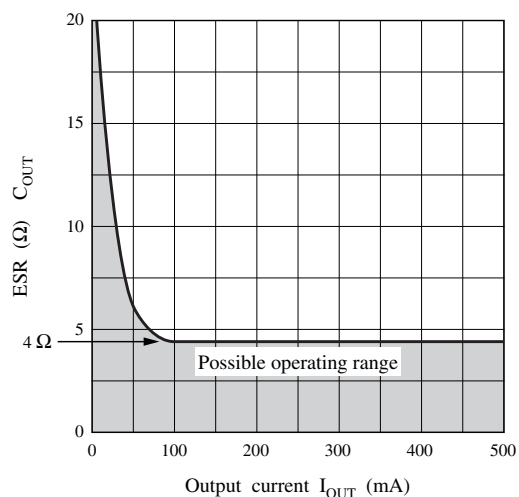
Connect the input pin and ground pin with a 3.3  $\mu\text{F}$  capacitor and the output pin and ground pin with a 33  $\mu\text{F}$  capacitor in order to keep the stability of the IC in operation. Make sure that the 3.3  $\mu\text{F}$  capacitor is as close as possible to the input pin and ground pin while the 33  $\mu\text{F}$  capacitor is as close to the output pin and ground pin as possible.

As the stability is affected by the parasitic capacitance and impedance of the PCB pattern, pay utmost attention to the PCB layout.

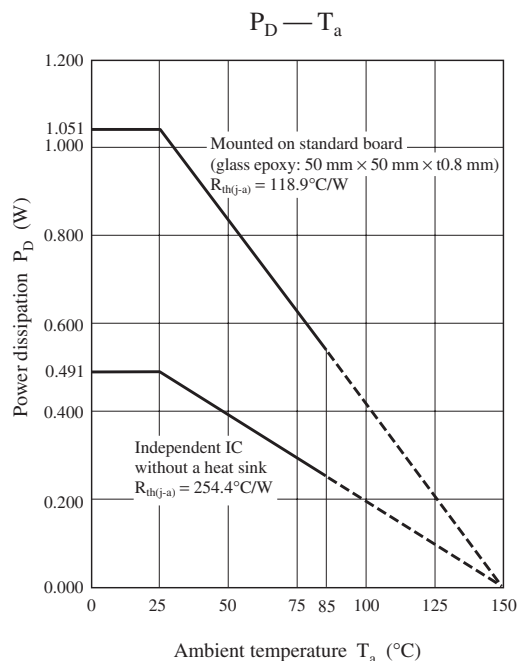
Select each capacitor in consideration of the ESR (equivalent series resistance) of the capacitor for the AN80MxxRSP Series conduct a full evaluation under the right operating conditions.

The ESR of an aluminum or tantalum electrolytic capacitor may increase at low temperatures. Therefore, it is recommended to connect a 0.1  $\mu\text{F}$  to 0.47  $\mu\text{F}$  capacitor with low internal impedance, such as a multi-layer ceramic capacitor, in parallel to each capacitor.

Output current — Output capacitor ESR (equivalent series resistance)



### 2. $P_D$ — $T_a$ curves of SP-5SU

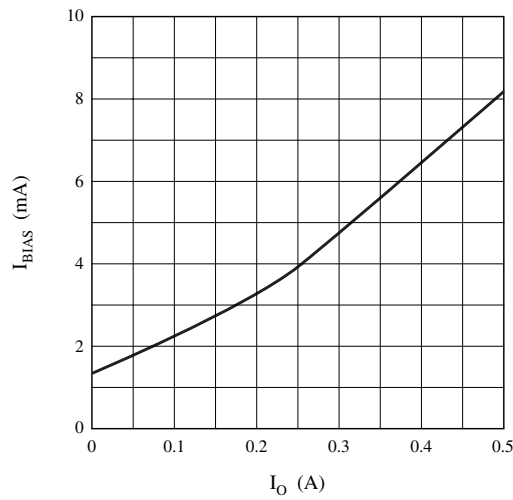


■ Application Notes (continued)

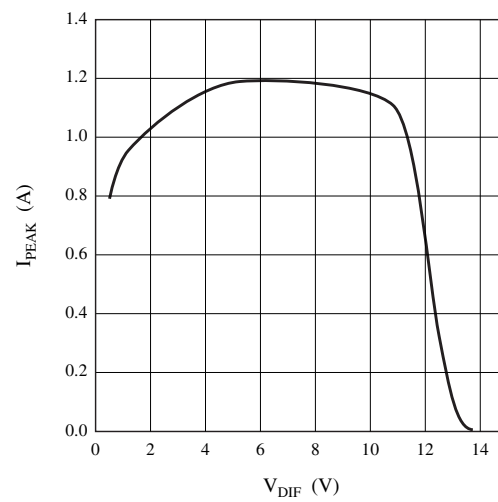
3. Main characteristics

• AN80MxxRSP series

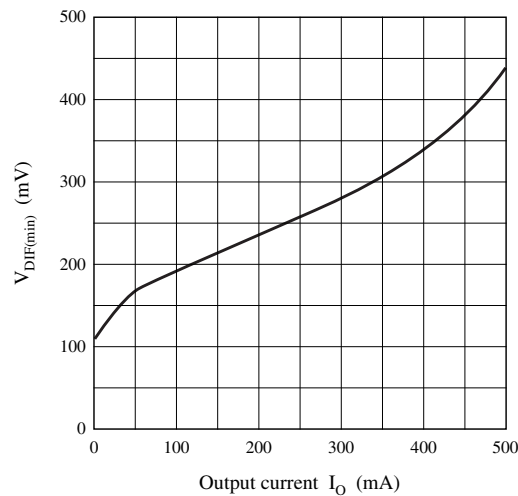
Bias current under no load, bias current fluctuation to load



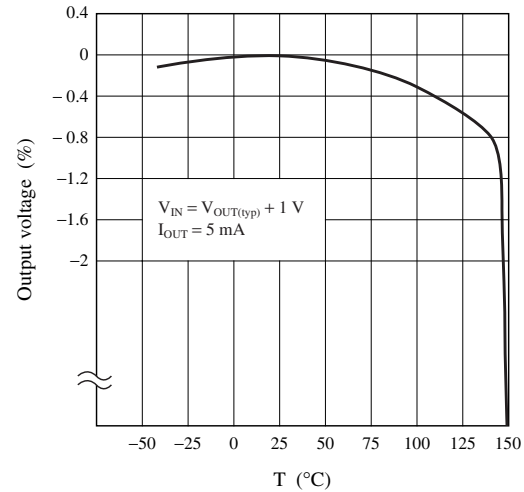
Peak output current



Minimum input/output voltage difference



Output voltage temperature characteristic



• AN80M18RSP

